Soil Models for Lateral Load Tests

Stiff clay

The stiff clay model proposed by Reese, et al. (1975) has been used for simulating laterally loaded drilled shafts that are embedded in weathered rock. The model is presented in Equation 24. For all stiff clay profiles, undrained shear strength is estimated as 200 kPa, and the major principal strain at 50% of the maximum stress level, ε_{50}, is 0.004.

Equation 24 $$\frac{P}{P_{ur}} = \left(\frac{y}{16 y_{50}} \right)^{0.25}$$

P-y Curves of Reese's Weak Rock Model

Reese (1997)'s Weak rock model was developed based on data from two load tests, and is still considered 'interim' due to the limited data used in its development. The ultimate lateral resistance is estimated based on the compressive strength of the embedded rock and geometrical conditions, as shown in Equation 25 and Equation 26.

Equation 25 $$p_{ur} = \alpha_r q_{ur} b \left(1 + \frac{1.4 x_r}{b} \right)$$

Equation 26 $$p_{ur} = 5.2 \alpha_r q_{ur} b$$

where,

q_{ur} = compressive strength of the rock (usually the lower-bound as a function of depth)

α_r=strength reduction factor

B=width, or diameter of the pile

x_r=depth below the rock surface.

More details on this method were presented in the NCDOT report by Gabr et al. (2002). Also in the same report, the geotechnical properties and the P-y curves were presented for ten lateral load tests. Figure 117 shows the profiles of ultimate resistance using Reese's